CLAIMS

What is claimed is:

1. A polymeric composition comprising repeat units derived from (1) a carbonyl compound, (2) a monomer, and (3) phosphorochloridite wherein said carbonyl compound has the formula selected from the group consisting of $(R^1O_2C)_m(OH)$-Ar^1-$(OH)(CO_2R^1)_m$, $(R^1O_2C)_m(OH)$-Ar^2-A^2-Ar^2-$(OH)(CO_2R^1)_m$, $(R^1O_2C)_m$ -Ar^2-Ar^2-$(CO_2R^1)_m$ and combinations of two or more thereof;

said monomer is selected from the group consisting of polyhydric alcohols, amines, and combinations thereof,

said phosphorochloridite has the formula selected from the group consisting of $ClP(O\text{-}Ar^2\text{-}R^2)_2$; the Ar^2 groups in $ClP(O\text{-}Ar^2\text{-}R^2)_2$ are unlinked to each other, directly linked to each other, or linked to each other through group A^2;

each Ar^1 is selected from the group consisting of C_6 to C_{40} phenylene group, C_{12} to C_{40} biphenylene group, C_{10} to C_{40} naphthylene group, C_{20} to C_{40} binaphthylene group, and combinations of two or more thereof;

each Ar^2 is independently selected from the group consisting of C_6 to C_{40} phenylene group, C_{10} to C_{40} naphthylene group, and combinations thereof;

A^2 is selected from the group consisting of $-C(R^1)(R^1)$-, -O-, $-N(R^1)$-, -S-, $-S(O)_2$-, -S(O)-, and combinations of two or more thereof;

each R^1 is independently selected from the group consisting of hydrogen, C_1 to C_{12} alkyl group or cycloalkyl group, C_6 to C_{20} aryl group, and combinations of two or more thereof;

each R^2 is independently selected from the group consisting of hydrogen, C_1 to C_{12} alkyl or cycloalkyl group, acetal, ketal, $-OR^3$, $-CO_2R^3$, C_6 to C_{20} aryl group, F, Cl, $-NO_2$, $-SO_3R^3$, -CN, perhaloalkyl, $-S(O)R^3$, $-S(O)_2R^3$, -CHO, $-C(O)R^3$, cyclic ether, $-A^1Z$, and combinations of two or more thereof;

A^1 is a C_1 to C_{12} alkylene group;

Z is selected from the group consisting of $-CO_2R^3$, -CHO, $-C(O)R^3$, $-C(O)SR^3$, $-SR^3$, $-C(O)NR^1R^1$, $-OC(O)R^3$, $-OC(O)OR^3$, $-N=C(R^1)R1$, $-C(R^1)=NR^1$, $-C(R^1)=N\text{-}O\text{-}R^1$, $-P(O)(OR^3)(OR^3)$, $-S(O)_2R^3$, $-S(O)R^3$, $-C(O)OC(O)R^3$, $-NR^3CO_2R^3$, $-NR^3C(O)N(R^1)R^1$, F, Cl, $-NO_2$, $-SO_3R^3$, -CN, and combinations of two or more thereof;

each R^3 is independently selected from the group consisting of C_1 to C_{12} alkyl or cycloalkyl group, C_6 to C_{20} aryl group, and combinations thereof; and

each m is independently a number in the range of from 1 to 2.

2. A composition according to Claim 1 wherein R^2 in $ClP(O\text{-}Ar^2\text{-}R^2)_2$ is ortho to the oxygen attached to phosphorus.

3. A composition according to Claim 1, or 2 wherein said monomer is a polyhydric alcohol selected from the group consisting of dialcohols, trialcohols, tetraalcohols, and combinations of two or more thereof.

4. A composition according to Claim 1, 2, or 3 wherein said polyhydric alcohol has the formula selected from the group consisting of $(HO)_m\text{-}A^1\text{-}(OH)_m$, $(HO)_m\text{-}Ar^2\text{-}A^1\text{-}Ar^2\text{-}(OH)_m$, $(HO)_m\text{-}Ar^2\text{-}(O)\text{-}A^1\text{-}(O)\text{-}Ar^2\text{-}(OH)_m$, $(HO)_m\text{-}(A^1\text{-}O)_p\text{-}A^1\text{-}(OH)_m$, $(HO\text{-}A^1)_m(OH)\text{-}Ar^1\text{-}(OH)(A^1\text{-}OH)_m$, $(HO\text{-}A^1)_m(OH)\text{-}Ar^2\text{-}A^2\text{-}Ar^2\text{-}(OH)(A^1\text{-}OH)_m$, $(HO\text{-}A^1)_m(OH)\text{-}Ar^2\text{-}Ar^2\text{-}(OH)(A^1\text{-}OH)_m$, $(HO)_m\text{-}Ar^2\text{-}(O\text{-}A^1)_p\text{-}O\text{-}Ar^2\text{-}(OH)_m$, $(OH)_m\text{-}Ar^2\text{-}Ar^2\text{-}(OH)_m$, $(OH)_m\text{-}Ar^2\text{-}A^2\text{-}Ar^2\text{-}(OH)_m$, $(HO)_m\text{-}Ar^2\text{-}A^1\text{-}C(O)\text{-}O\text{-}A^1\text{-}O\text{-}C(O)\text{-}A^1\text{-}Ar^2\text{-}(OH)_m$, $(OH)\text{-}Ar^1\text{-}(OH)$, and combinations of two or more thereof;

Ar^1, Ar^2, A^2, and m are the same as recited in Claim 1;

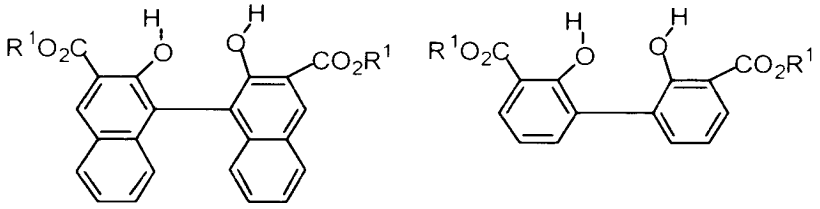
each A^1 is independently a C_1 to C_{12} alkylene group; and

each p is independently a number in the range of from 1 to 10.

5. A composition according to Claim 4 wherein said polyhydric alcohol is selected from the group consisting of 1,3-propananediol, tetra(ethylene glycol), 1,6-hexanediol, 1,4-cyclohexanediol, 2,6-dihydroxynaphthalene, hexa(ethylene glycol), and combinations of two or more thereof.

6. A composition according to Claim 1 wherein said monomer is an amine selected from the group consisting of 1,6-hexadiamine, N,N'-dimethyhexanediamine, 1,4-butanediamine, and combinations of two or more thereof.

7. A composition according to any of claims 1 to 6 wherein said carbonyl compound is selected from the group consisting of



and combinations thereof; and each R^1 is the same as recited in Claim 1.

8. A composition according to Claim 7 wherein said carbonyl compound is selected from the group consisting of dialkyl 2,2'-dihydroxyl-1,1'-binaphthalene-3,3'-dicarboxylate, dialkyl 2,2'-dihydroxyl-1,1'-biphenyl-3,3'-dicarboxylate, 2,2'-dihydroxy-biphenyl-3,3'-dicarboxylic acid, 2,2'-dihydroxy-1,1'-binaphthyl-3,3'-dicarboxylic acid and combinations of two or more thereof.

9. A composition according to any of Claims 1 to 8 wherein said carbonyl compound is blended with one or more second carbonyl compounds selected from the group consisting of $(R^1O_2C)_m$ -Ar^1-$(CO_2R^1)_m$, $(R^1O_2C)_m$ -A^1-$(CO_2R^1)_m$, $(R^1O_2C)_m$ -Ar^2-A^1-Ar^2-$(CO_2R^1)_m$, $(R^1O_2C)_m$ -Ar^2-(O)-A^1-(O)-Ar^2-$(CO_2R^1)_m$, $(R^1O_2C)_m$ -$(A^1$-$O)_p$-A^1-$(CO_2R^1)_m$, and combinations of two or more thereof.

10. A composition according to Claim 9 wherein said second carbonyl compound is selected from the group consisting of terephthalic acid, isophthalic acid, phthalic acid, dimethyl isophthalate, dimethyl phthalate, dimethyl terephthalate, 1,3,5-benzenetricarboxylic acid, and combinations of two or more thereof.

11. A polymeric composition comprising repeat units derived from (1) phosphorus trichloride, (2) polyhydric alcohol, and (3) an aromatic diol.

12. A composition according to Claim 11 wherein said polyhydric alcohol is selected from the group consisting of dialcohols, trialcohols, tetraalcohols, and combinations of two or more thereof.

13. A composition according to Claim 12 wherein said polyhydric alcohol is selected from the group consisting of $(R^4)(HO)_m$-Ar^2-A^1-Ar^2-$(OH)_m(R^4)$, $(R^4)(HO)_m$-Ar^2-(O-$A^1)_p$-O-Ar^2-$(OH)_m(R^4)$, $(R^4)(OH)_m$-Ar^2-Ar^2-$(OH)_m(R^4)$, $(R^4)(OH)_m$-Ar^2-A^2-Ar^2-$(OH)_m(R^4)$, $(R^4)(HO)_m$-Ar^2-A^1-C(O)-O-A^1-O-C(O)-A^1-Ar^2-$(OH)_m(R^4)$, $(R^4)(OH)_m$-Ar^1-$(OH)_m(R^4)$, and combinations of two or more thereof;

each Ar^1 is independently selected from the group consisting of phenylene group, biphenylene group, naphthylene group, binaphthylene group, and combinations of two or more thereof;

each Ar^2 is independently selected from the group consisting of phenylene group, naphthylene group, and combinations thereof;

each A^1 is independently a C_1 to C_{12} aklylene group;

each A^2 is independently selected from the group consisting of -$C(R^1)(R^1)$-, -O-, -$N(R^1)$-, -S-, -$S(O)_2$-, -S(O)-, and combinations of two or more thereof;

each R^1 is independently selected from the group consisting of hydrogen, C_1 to C_{12} alkyl or cycloalkyl group, C_6 to C_{20} aryl group, and combinations of two or more thereof;

each R^4 is independently selected from the group consisting of hydrogen, C_1 to C_{12} alkyl or cycloalkyl group, acetal, ketal, -OR^3, -CO_2R^3, C_6 to C_{20} aryl group, -SiR^3, -NO_2, -SO_3R^3, -S(O)R^3, -$S(O)_2R^3$, -CHO, -C(O)R^3, F, Cl,

-CN, perhaloalkyl, -C(O)N(R^3)(R^3), -A^1Z, and combinations of two or more thereof;

Z is selected from the group consisting of -CO_2R^3, -CHO, -C(O)R^3, -C(O)SR^3, -SR^3, -C(O)NR^1R^1, -OC(O)R^3, -OC(O)OR^3, -N=C(R^1)R1, -C(R^1)=NR^1, -C(R^1)=N-O-R^1, -P(O)(OR^3)(OR^3), -$S(O)_2R^3$, -S(O)R^3, -C(O)OC(O)R^3, -$NR^3CO_2R^3$, -NR^3C(O)N(R^1)R^1, F, Cl, -NO_2, -SO_3R^3, -CN, and combinations of two or more thereof;

each R^3 is independently selected from the group consisting of C_1 to C_{12} alkyl or cycloalkyl group, C_1 to C_{20} aryl group, and combinations thereof;

each m is independently a number in the range of from 1 to 2; and

each p is independently a number in the range of from 1 to 10.

14. A composition according to Claim 13 wherein

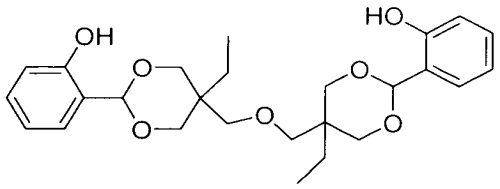
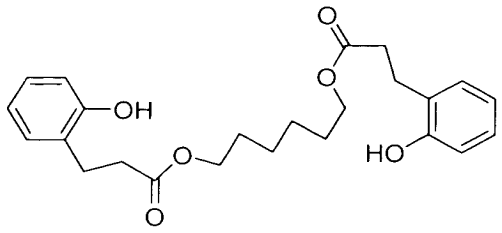
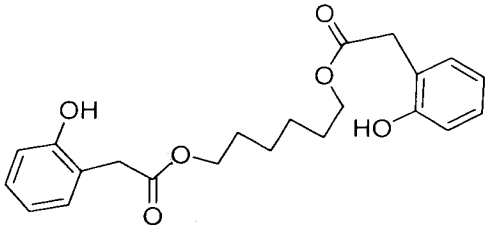
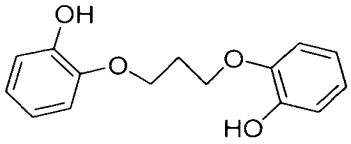
said polyhydric alcohol is selected from the group consisting of $(OH)_mAr^1$-R^4-R^4-$Ar^1(OH)_m$ and $(OH)_mAr^1$-R^4-A^1-R^4-$Ar^1(OH)_m$;

Ar^1 and A^1 are the same as recited in Claim 13; and

each R^4 is independently selected from the group consisting of C_1 to C_{12} alkyl or cycloalkyl group, acetal, ketal, -OR^3, -CO_2R^3, C_6 to C_{20} aryl group, -SiR^3, -SO_3R^3, -S(O)R^3, -$S(O)_2R^3$, perhaloalkyl, -C(O)N(R^3)(R^3), -$A^1CO_2R^3$, -A^1OR^3 and combinations of two or more thereof.

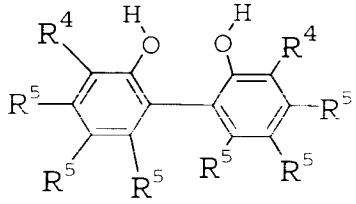
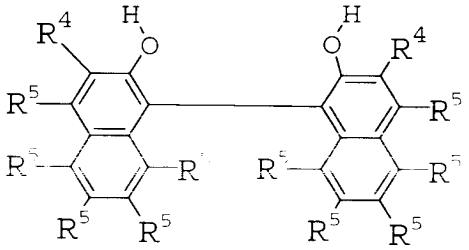
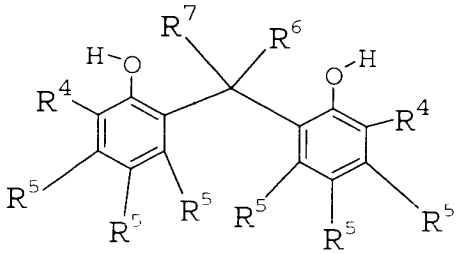
15. A composition according to Claim 13 or 14 wherein the location of the OH groups of said polyhydric alcohol are placed such that, when said polyhydric alcohol is contacted with PCl_3, monodentate phosphites are not predominately produced.

16. A composition according to Claim 13, 14, or 15 said polyhydric alcohol is selected from the group consisting of 6,6'-dihydroxy-4,4,4',7,7,7'-hexamethyl bis-2,2'-spirochroman, 2,2'-diallylbisphenolA, bisphenol A, 4,4'-(1-methylethylidene)bis(2-(1-methylpropyl)phenol), 4,4'-thiophenol, 4,4'-dihydroxydiphenylsulfone, 4,4'-sulfonylbis(2-methylphenol), bis(4-hydroxy-3,-methylphenyl)sulfide, 2,2'-dis(4-hydroxy-3-methylphenyl)propane, 4,4'-ethylidenebis(2,5-dimethylphenol), 4,4'-propylidenebis(2,5-dimethylphenol), 4,4'-benzylidenebis(2,5-dimethylphenol), 4,4'-ethylidenebis(2-isopropyl-5-methylphenol).

and combinations of two or more thereof.

17. A composition according to any of Claims 11 to 16 wherein said aromatic diol has the formula selected from the group consisting of

and combinations of two or more thereof;

each R^4 is independently selected from the group consisting of hydrogen, C_1 to C_{12} alkyl or cycloalkyl group, acetal, ketal, $-OR^3$, $-CO_2R^3$, C_6 to C_{20} aryl group, $-SiR^3$, $-NO_2$, $-SO_3R^3$, $-S(O)R^3$, $-S(O)_2R^3$, -CHO, $-C(O)R^3$, -F, -Cl, -CN,

$-CF_3$, $-C(O)N(R^3)(R^3)$, $-A^1Z$, and combinations of two or more thereof;

Z is selected from the group consisting of $-CO_2R^3$, -CHO, $-C(O)R^3$, $-C(O)SR^3$, $-SR^3$, $-C(O)NR^1R^1$, $-OC(O)R^3$, $-OC(O)OR^3$, $-N=CR^1R^1$, $-C(R^1)=NR^1$, $-C(R^1)=N-O-R^1$, $-P(O)(OR^3)(OR^3)$, $-S(O)_2R^3$, $-S(O)R^3$, $-C(O)OC(O)R^3$,

$-NR^3CO_2R^3$, $-NR^3C(O)NR^1R^1$, F, Cl, $-NO_2$, $-SO_3R^3$, -CN, and combinations of two or more thereof;

each R^3 is independently selected from the group consisting of C_1 to C_{12} alkyl or cycloalkyl group, C_6 to C_{20} aryl group, and combinatons of two or more thereof;

each R^5 is independently selected from the group consisting of H, F, Cl, C_1 to C_{12} alkyl, C_1 to C_{12} cycloalkyl, C_6 to C_{20} aryl, $-OR^3$, $-CO_2R^3$, $-C(O)R^3$, -CHO, -CN, $-CF_3$, and combinations of two or more thereof;

each R^6 independently is selected from the group consisting of H, C_1 to C_{12} alkyl, C_1 to C_{12} cycloalkyl, C_6 to C_{20} aryl, and combinations of two or more thereof; and

each R^7 independently is selected from the group consisting of H, C_1 to C_{12} alkyl, C_1 to C_{12} cycloalkyl, C_6 to C_{20} aryl, and combinations of two or more thereof.

18. A composition according to any of Claims 1 to 17 further comprising at least one Group VIII metal selected from the group consisting of nickel, palladium, cobalt, and combinations of two or mote thereof.

19. A composition according to Claim 18 further comprising at least one Lewis acid which is an inorganic compound or organometallic compound in which the element of said inorganic compound or organometallic compound is selected from the group consisting of scandium, titanium, vanadium, chromium, manganese, iron, cobalt, copper, zinc, boron, aluminum, yttrium, zirconium, niobium, molybdenum, cadmium, rhenium, tin, and combinations of two or more thereof.

20. A composition according to Claim 19 wherein said Lewis acid is selected from the group consisting of $ZnBr_2$, ZnI_2, $ZnCl_2$, $ZnSO_4$, $CuCl_2$, CuCl, $Cu(O_3SCF_3)_2$, $CoCl_2$, CoI_2, FeI_2, $FeCl_3$, $FeCl_2$(tetrahydrofuran)$_2$, $FeCl_2$, $TiCl_4$(tetrahydrofuran)$_2$, $TiCl_4$, $TiCl_3$, $ClTi(OiPr)_3$, $MnCl_2$, $ScCl_3$, $AlCl_3$, $(C_8H_{17})AlCl_2$, $(C_8H_{17})_2AlCl$, (iso-$C_4H_9)_2AlCl$, (phenyl)$_2AlCl$, phenyl$AlCl_2$, $ReCl_5$, $ZrCl_4$, $NbCl_5$, VCl_3, $CrCl_2$, $MoCl_5$, YCl_3, $CdCl_2$, $LaCl_3$, $Er(O_3SCF_3)_3$, $Yb(O_2CCF_3)_3$, $SmCl_3$, $TaCl_5$, $CdCl_2$, $B(C_6H_5)_3$, and $(C_6H_5)_3SnX$, and combinations of two or more thereof; and X is selected from the group consisting of CF_3SO_3, $CH_3C_6H_5SO_3$, $(C_6H_5)_3BCN$, and combinations of two or more thereof.

21. A composition according to Claim 20 wherein said Lewis acid is selected from the group consisting of zinc chloride, cadmium chloride, iron chloride, triphenylboron, $(C_6H_5)_3SnX$, and combinations of two or more thereof;

and X is selected from the group consisting of CF_3SO_3, $CH_3C_6H_3SO_3$, $(C_6H_3)_3BCN$, and combinations of two or more thereof.

22 A process comprising (1) contacting a carbonyl compound with a monomer to produce an intermediate and (2) contacting said intermediate with a phosphorchloridite wherein

said carbonyl compound has the formula selected from the group consisting of $(R^1O_2C)_m(OH)\text{-}Ar^1\text{-}(OH)(CO_2R^1)_m$, $(R^1O_2C)_m(OH)\text{-}Ar^2\text{-}A^2\text{-}Ar^2\text{-}(OH)(CO_2R^1)_m$, $(R^1O_2C)_m\text{-}Ar^2\text{-}Ar^2\text{-}(CO_2R^1)_m$ and combinations of two or more thereof;

said monomer is selected from the group consisting of polyhydric alcohols, amines, and combinations thereof;

said phosphorochloridite has the formula selected from the group consisting of $ClP(O\text{-}Ar^2\text{-}R^2)_2$; the Ar^2 groups in $ClP(O\text{-}Ar^2\text{-}R^2)_2$ are unlinked to each other, directly linked to each other, or linked to each other through group A^2;

each Ar^1 is selected from the group consisting of phenylene group, biphenylene group, naphthylene group, binaphthylene group, and combinations of two or more thereof;

each Ar^2 is independently selected from the group consisting of phenylene group, naphthylene group, and combinations thereof;

A^2 is selected from the group consisting of $\text{-}C(R^1)(R^1)\text{-}$, -O-, $\text{-}N(R^1)\text{-}$, -S-, $\text{-}S(O)_2\text{-}$, -S(O)-, and combinations of two or more thereof;

each R^1 is independently selected from the group consisting of hydrogen, C_1 to C_{12} alkyl or cycloalkyl group, C_6 to C_{20} aryl group, and combinations of two or more thereof;

each R^2 is independently selected from the group consisting of hydrogen, C_1 to C_{12} alkyl or cycloalkyl group, acetal, ketal, $\text{-}OR^3$, $\text{-}CO_2R^3$, C_6 to C_{20} aryl group, F, Cl, $\text{-}NO_2$, $\text{-}SO_3R^3$, -CN, perhaloalkyl, $\text{-}S(O)R^3$, $\text{-}S(O)_2R^3$, -CHO, $\text{-}C(O)R^3$, cyclic ether, $\text{-}A^1Z$, and combinations of two or more thereof;

Z is selected from the group consisting of $\text{-}CO_2R^3$, -CHO, $\text{-}C(O)R^3$, $\text{-}C(O)SR^3$, $\text{-}SR^3$, $\text{-}C(O)NR^1R^1$, $\text{-}OC(O)R^3$, $\text{-}OC(O)OR^3$, $\text{-}N{=}C(R^1)R1$, $\text{-}C(R^1){=}NR^1$, $\text{-}C(R^1){=}N\text{-}O\text{-}R^1$, $\text{-}P(O)(OR^3)(OR^3)$, $\text{-}S(O)_2R^3$, $\text{-}S(O)R^3$, $\text{-}C(O)OC(O)R^3$, $\text{-}NR^3CO_2R^3$, $\text{-}NR^3C(O)N(R^1)R^1$, F, Cl, $\text{-}NO_2$, $\text{-}SO_3R^3$, -CN, and combinations of two or more thereof;

A^1 is a C^1 to C^{12} alkylene group;

each R^3 is independently selected from the group consisting of C_1 to C_{12} alkyl or cycloalkyl group, C_6 to C_{20} aryl group, and combinations thereof; and

each m is independently a number in the range of from 1 to 2.

23. A process according to Claim 22 wherein R^2 in $ClP(O\text{-}Ar^2\text{-}R^2)_2$ is ortho to the oxygen attached to phosphorus.

24. A process according to Claim 22 or 23 wherein said monomer is a polyhydric alcohol selected from the group consisting of dialcohols, trialcohols, tetraalcohols, and combinations of two or more thereof.

25. A process according to Claim 22, 23, or 24 wherein said polyhydric alcohol has the formula selected from the group consisting of $(HO)_m\text{-}A^1\text{-}(OH)_m$, $(HO)_m\text{-}Ar^2\text{-}A^1\text{-}Ar^2\text{-}(OH)_m$, $(HO)_m\text{-}Ar^2\text{-}(O)\text{-}A^1\text{-}(O)\text{-}Ar^2\text{-}(OH)_m$, $(HO)_m\text{-}(A^1\text{-}O)_p\text{-}A^1\text{-}(OH)_m$, $(HO\text{-}A^1)_m(OH)\text{-}Ar^1\text{-}(OH)(A^1\text{-}OH)_m$, $(HO\text{-}A^1)_m(OH)\text{-}Ar^2\text{-}A^2\text{-}Ar^2\text{-}(OH)(A^1\text{-}OH)_m$, $(HO\text{-}A^1)_m(OH)\text{-}Ar^2\text{-}Ar^2\text{-}(OH)(A^1\text{-}OH)_m$, $(HO)_m\text{-}Ar^2\text{-}(O\text{-}A^1)_p\text{-}O\text{-}Ar^2\text{-}(OH)_m$, $(OH)_m\text{-}Ar^2\text{-}Ar^2\text{-}(OH)_m$, $(OH)_m\text{-}Ar^2\text{-}A^2\text{-}Ar^2\text{-}(OH)_m$, $(HO)_m\text{-}Ar^2\text{-}A^1\text{-}C(O)\text{-}O\text{-}A^1\text{-}O\text{-}C(O)\text{-}A^1\text{-}Ar^2\text{-}(OH)_m$, $(OH)\text{-}Ar^1\text{-}(OH)$, and combinations of two or more thereof;

Ar^1, Ar^2, A^2, and m are the same as recited in Claim 22;

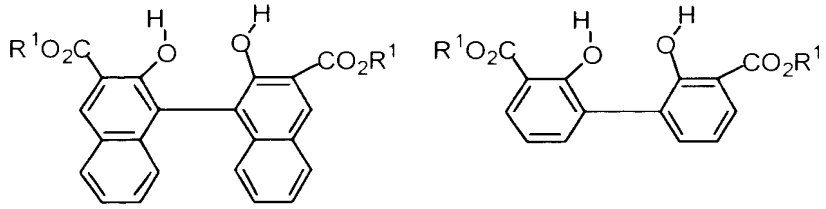
each A^1 is independently a C_1 to C_{12} alkylene group; and

each p is independently a number in the range of from 1 to 10.

26. A process according to Claim 25 wherein said polyhydric alcohol is selected from the group consisting of 1,3-propananediol, tetra(ethylene glycol), 1,6-hexanediol, 1,4-cyclohexanediol, 2,6-dihydroxynaphthalene, hexa(ethylene glycol), and combinations of two or more thereof.

27. A process according to Claim 22 wherein said monomer is said amine selected from the group consisting of 1,6-hexadiamine, N,N'-dimethylhexanediamine, 1,4-butanediamine, and combinations of two or more thereof.

28. A process according to any of Claims 22 to 27 wherein said carbonyl compound is selected from the group consisting of



and combinations thereof; and each R^1 is the same as recited in Claim 22.

29. A process according to Claim 28 wherein said carbonyl compound is selected from the group consisting of dialkyl 2,2' dihydroxyl 1,1' binaphthalene-3,3'-dicarboxylate, dialkyl 2,2'-dihydroxyl-1,1'-biphenyl-3,3'-dicarboxylate, 2,2'-dihydroxy-biphenyl-3,3'-dicarboxylic acid, 2,2'-dihydroxy-1,1'-binaphthyl-3,3'-dicarboxylic acid and combinations of two or more thereof.

30. A process according to any of Claims 22 to 29 wherein said carbonyl compound is blended with a second carbonyl compound.

31. A process according to Claim 30 wherein said second carbonyl compound is selected from the group consisting of terephthalic acid, isophthalic acid, phthalic acid, dimethyl isophthalate, dimethyl phthalate, dimethyl terephthalate, 1,3,5-benzenetricarboxylic acid, and combinations of two or more thereof.

32. A process according to any of Claims 22 to 31 wherein said contacting in step (1) is carried out at a temperature in the range of from about 100°C to about 450°C; said contacting in step (2) is carried out at a temperature in the range of from about -50°C to about 150°C; and the ratio of said phosphorochloridite to the alcohol group of said intermediate is in the range of from about 10:1 to about 0.5:1.

33. A process according to Claim 32 wherein said contacting in step (1) is carried out at a temperature in the range of from 180°C to 270°C for about 1 minute to about 24 hours; said contacting in step (2) is carried out at a temperature in the range of from -30°C to about 80°C for about 1 minute to about 24 hours ; the ratio of said phosphorochloridite to the alcohol group of said intermediate is about 1:1; and said process is carried out in the presence of an organic base.

34. A process comprising (a) contacting PCl_3 with a polyhydric alcohol to produce a phosphorus-containing polymer and (b) contacting said phosphorus-containing polymer with an aromatic diol.

35. A process comprising (a) contacting an N,N-dialkyl dichlorophosphoramidite with a polyhydric alcohol to produce a polymeric phosphoramidite, (b) contacting said polymeric phosphoramidite with an acid to produce a phosphorus-containing polymer and (c) contacting said phosphorus-containing polymer with an aromatic diol.

36. A process according to Claim 34 or 35 wherein said polyhydric alcohol is selected from the group consisting of dialcohols, trialcohols, tetraalcohols, and combinations of two or more thereof.

37. A process according to Claim 36 wherein

said polyhydric alcohol is selected from the group consisting of $(R^4)(HO)_m$-Ar^2-A^1-Ar^2-$(OH)_m(R^4)$, $(R^4)(HO)_m$-Ar^2-$(O$-$A^1)_p$-O-Ar^2-$(OH)_m(R^4)$, $(R^4)(OH)_m$-Ar^2-Ar^2-$(OH)_m(R^4)$, $(R^4)(OH)_m$-Ar^2-A^2-Ar^2-$(OH)_m(R^4)$, $(R^4)(HO)_m$-Ar^2-A^1-$C(O)$-O-A^1-O-$C(O)$-A^1-Ar^2-$(OH)_m(R^4)$, $(R^4)(OH)_m$-Ar^1-$(OH)_m(R^4)$, and combinations of two or more thereof;

each Ar^1 is independently selected from the group consisting of C_6 to C_{40} phenylene group, C_{12} to C_{40} biphenylene group, C_{10} to C_{40} naphthylene group, C_{20} to C_{40} binaphthylene group, and combinations of two or more thereof;

each Ar^2 is independently selected from the group consisting of C_6 to C_{40} phenylene group, C_{10} to C_{40} naphthylene group, and combinations thereof;

each A^1 is independently a C_1 to C_{12} aklylene group;

each A^2 is independently selected from the group consisting of $-C(R^1)(R^1)$, -O-, $-N(R^1)$-, -S-, $-S(O)_2$-, -S(O)-, and combinations of two or more thereof;

each R^1 is independently selected from the group consisting of hydrogen, C_1 to C_{12} alkyl or cycloalkyl group, C_6 to C_{20} aryl group, and combinations of two or more thereof;

each R^4 is independently selected from the group consisting of hydrogen, C_1 to C_{12} alkyl or cycloalkyl group, acetal, ketal, $-OR^3$, $-CO_2R^3$, C_1 to C_{20} aryl group, $-SiR^3$, $-NO_2$, $-SO_3R^3$, $-S(O)R^3$, $-S(O)_2R^3$, -CHO, $-C(O)R^3$, F, Cl, -CN, perhaloalkyl, $-C(O)N(R^3)(R^3)$, $-A^1Z$, and combinations of two or more thereof;

Z is selected from the group consisting of $-CO_2R^3$, -CHO, $-C(O)R^3$, $-C(O)SR^3$, $-SR^3$, $-C(O)NR^1R^1$, $-OC(O)R^3$, $-OC(O)OR^3$, $-N=C(R^1)R1$, $-C(R^1)=NR^1$, $-C(R^1)=N-O-R^1$, $-P(O)(OR^3)(OR^3)$, $-S(O)_2R^3$, $-S(O)R^3$, $-C(O)OC(O)R^3$, $-NR^3CO_2R^3$, $-NR^3C(O)N(R^1)R^1$, F, Cl, $-NO_2$, $-SO_3R^3$, -CN, and combinations of two or more thereof;

each R^3 is independently selected from the group consisting of C_1 to C_{12} alkyl or cycloalkyl group, C_6 to C_{20} aryl group, and combinations thereof;

each m is independently a number in the range of from 1 to 2; and

each p is independently a number in the range of from 1 to 10.

38. A process according to Claim 36 wherein

said polyhydric alcohol is selected from the group consisting of $(OH)_mAr^1$-R^4-R^4-$Ar^1(OH)_m$ and $(OH)_mAr^1$-R^4-A^1-R^4-$Ar^1(OH)_m$;

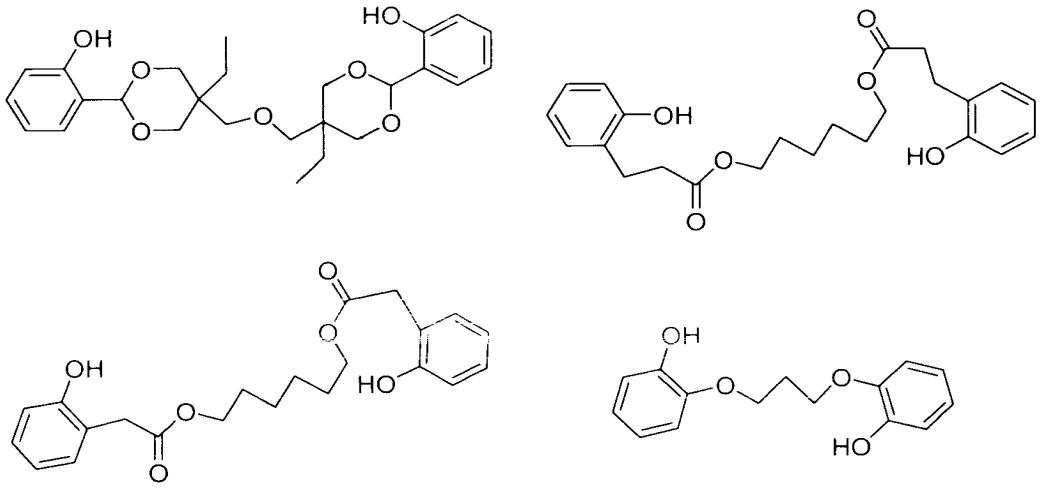
Ar^1 and A^1 are the same as recited in Claim 14; and

each R^4 is independently selected from the group consisting of C_1 to C_{12} alkyl or cycloalkyl group, acetal, ketal, $-OR^3$, $-CO_2R^3$, C_1 to C_{20} aryl group, $-SiR^3$, $-SO_3R^3$, $-S(O)R^3$, $-S(O)_2R^3$, perhaloalkyl, $-C(O)N(R^3)(R^3)$, $-A^1CO_2R^3$, $-A^1OR^3$ and combinations of two or more thereof.

39. A process according to Claim 37 or 38 wherein the location of the OH groups of said polyhydric alcohol are placed such that, when said polyhydric

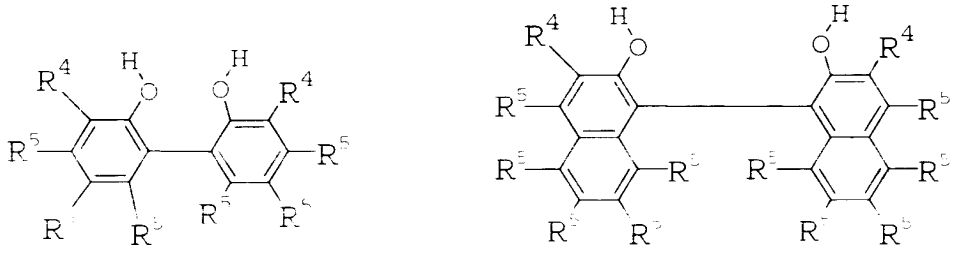
alcohol is contacted with PCl_3, monodentate phosphites are not predominately produced.

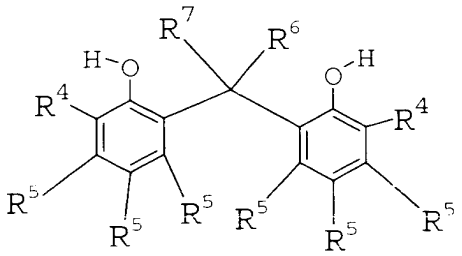
40. A process according to Claim 37, 38, or 39 wherein said polyhydric alcohol is selected from the group consisting of 6,6'-dihydroxy-4,4,4',7,7,7'-hexamethyl bis-2,2'-spirochroman, 2,2'-diallylbisphenolA, bisphenol A, 4,4'-(1-methylethylidene)bis(2-(1-methylpropyl)phenol), 4,4'-thiophenol, 4,4'-dihydroxydiphenylsulfone, 4,4'-sulfonylbis(2-methylphenol), bis(4-hydroxy-3,-methylphenyl)sulfide, 2,2'-dis(4-hydroxy-3-methylphenyl)propane, 4,4'-ethylidenebis(2,5-dimethylphenol), 4,4'-propylidenebis(2,5-dimethylphenol), 4,4'-benzylidenebis(2,5-dimethylphenol), 4,4'-ethylidenebis(2-isopropyl-5-methylphenol),



and combinations of two or more thereof.

41. A process according to any of Claims 34-40 wherein said aromatic diol has the formula selected from the group consisting of





and combinations of two or more thereof;

each R^4 is independently selected from the group consisting of hydrogen, C_1 to C_{12} alkyl group, C_1 to C_{12} cycloalkyl group, acetal, ketal, $-OR^3$, $-CO_2R^3$, C_1 to C_{20} aryl group, $-SiR^3$, $-NO_2$, $-SO_3R^3$, $-S(O)R^3$, $-S(O)_2R^3$, -CHO, $-C(O)R^3$, -F, -Cl, -CN, $-CF_3$, $-C(O)N(R^3)(R^3)$, $-A^1Z$, and combinations of two or more thereof;

Z is selected from the group consisting of-CO_2R^3, -CHO, $-C(O)R^3$, $-C(O)SR^3$, $-SR^3$, $-C(O)NR^1R^1$, $-OC(O)R^3$, $-OC(O)OR^3$, $-N=CR^1R^1$, $-C(R^1)=NR^1$, $-C(R^1)=N-O-R^1$, $-P(O)(OR^3)(OR^3)$, $-S(O)_2R^3$, $-S(O)R^3$, $-C(O)OC(O)R^3$, $-NR^3CO_2R^3$, $-NR^3C(O)NR^1R^1$, F, Cl, $-NO_2$, $-SO_3R^3$, -CN, and combinations of two or more thereof;

each R^3 is independently selected from the group consisting of C_1 to C_{12} alkyl or cycloalkyl group, C_1 to C_{20} aryl group, and combinatons of two or more thereof;

each R^5 is independently selected from the group consisting of H, F, Cl, C_1 to C_{12} alkyl or cycloalkyl, C_6 to C_{20} aryl, $-OR^3$, $-CO_2R^3$, $-C(O)R^3$, -CHO, -CN, $-CF_3$, and combinations of two or more thereof;

each R^6 independently is selected from the group consisting of H, C_1 to C_{12} alkyl or cycloalkyl, C_6 to C_{20} aryl, and combinations of two or more thereof; and

each R^7 independently is selected from the group consisting of H, C_1 to C_{12} alkyl or cycloalkyl, C_6 to C_{20} aryl, and combinations of two or more thereof.

42. A process comprising an unsaturated compound with a fluid comprising hydrogen cyanide in the presence of a catalyst composition recited in any of Claims 18 to 21.

43. A process according to Claim 42 wherein

said unsaturated compound has 2 to about 30 carbon atoms per molecule and is selected from the formula of $R^8CH=CH-CH=CR^9$, $CH=CH-(CH_2)_x-R^{10}$, $CH_3-(CH_2)_y-CH=CH-(CH_2)_x-R^{10}$, and combinations of two or more thereof;

R^8 and R^9 are each independently selected from the group consisting of H, C_1 to C_3 alkyl, and combinations thereof;

R^{10} is selected from the group consisting of H, CN, CO_2R^{11}, perfluoroalkyl group having 1 to about 20 carbon atoms, and combinations of two or more thereof;

y is an integer of 0 to 12;

x is an integer of 0 to 12 if R^{10} is H, CO_2R^{11}, or perfluoroalkyl;

x is an integer of 1 to 12 if R^{10} is CN; and

R^{11} is selected from the group consisting of C_1 to C_{12} alkyl or cycloalkyl group, C_6 to C_{20} aryl group, and combinations of two or more thereof.

44. A process according to Claim 43 wherein said unsaturated compound is selected from the group consisting of butadiene, 3-pentenenitrile, 4-pentenenitrile, methyl 3-pentenoate, methyl 4-pentenoate, methyl 2-pentenoate, and combinations of two or more thereof.

45. A process comprising (a) contacting a diolefinic compound, in the presence of a catalyst composition, with a fluid comprising hydrogen cyanide to produce a 2-alkyl-3-monoalkenenitrile; and (b) contacting said 2-alkyl-3-monoalkenenitrile with said catalyst composition wherein said catalyst composition is recited in claims 18-21.

46. A process according to Claim 45 wherein said diolefinic compound is butadiene.

47. A process according to Claim 45 wherein said 2-alkyl-3-monoalkenenitrile is 2-methyl-3-butenenitrile.

48. A process comprising contacting a 2-alkyl-3-monoalkenenitrile with a catalyst composition recited in Claims 18-21.

49. A process according to Claim 48 wherein said 2-alkyl-3-monoalkenenitrile is 2-methyl-3-butenenitrile.